CLAIMS

1. A method comprising:

providing a mold having at least one component with at least one dimension less than 100 μm; and

filling the mold with a ceramic precursor.

2. The method of claim 1, wherein the ceramic precursor comprises at least two different atom types.

3. The method of claim 2, wherein the at least two different atom types are selected from a group consisting of carbon, nitrogen, boron, silicon, phosphorus, aluminum and hydrogen.

4. The method of claim 1, wherein the ceramic precursor comprises at least three different atom types.

5. The method of claim 1, further comprising heating the ceramic precursor to produce a ceramic structure.

6. The method of claim 5, wherein each atom type of the ceramic structure is derived from the ceramic precursor.

7. The method of claim 5, wherein the step of heating is performed under an inert atmosphere.

8. The method of claim 5, wherein the step of heating is performed under a moisture-free atmosphere.

9. The method of claim 1, wherein prior to the step of filling, the ceramic precursor is prepared to have sufficient viscosity to completely fill the mold.

10. The method of claim 9, wherein the viscosity of the ceramic precursor is adjusted to have a value less than about 500 cm^2/s.

11. The method of claim 1, wherein prior to the step of filling, the mold is treated such that it is inert with respect to reaction with the ceramic precursor and any subsequent products resulting from the ceramic precursor.

12. The method of claim 11, wherein the step of treating the mold comprises reacting the mold with an agent selected from the group consisting of alkylating, silylating, fluoroalkylating, or alkylsilylating agent.

13. The method of claim 1, wherein the step of filling comprises positioning a surface of the mold against a surface of a substrate to create a cavity which the ceramic precursor fills.

14. The method of claim 13, wherein the substrate is selected from the group consisting of silicon, silicon dioxide, silicon nitride, and any substrate with a smooth metallic surface.

15. The method of claim 13, further comprising treating the substrate surface to render the substrate inert with respect to reaction with the ceramic precursor and any subsequent products resulting from the ceramic precursor

16. The method of claim 15, wherein the step of treating comprises silanization.

17. The method of claim 1, wherein the step of filling comprises allowing the ceramic precursor to enter a volume of lower pressure.

18. The method of claim 1, wherein the step of filling comprises allowing the ceramic precursor to enter a volume by means of capillary action.

19. The method of claim 1, further comprising the step of curing the ceramic

precursor in the mold.

20. The method of claim 19, wherein the ceramic precursor is cured chemically.

21. The method of claim 19, wherein the ceramic precursor is cured thermally.

22. The method of claim 19, wherein the ceramic precursor is cured in the mold at a temperature of at least 100 °C.

23. The method of claim 19, wherein the ceramic precursor is cured in the mold under an inert atmosphere.

24. The method of claim 19, wherein the precursor is cured in the mold under a moisture-free atmosphere.

25. The method of claim 1, further comprising removing the mold from a product formed from the ceramic precursor.

26. The method of claim 25, wherein the step of removing the mold comprises physically removing the mold.

27. The method of claim 25, wherein the step of removing the mold comprises dissolving the mold.

28. The method of claim 27, wherein the step of dissolving comprises dissolving the mold in a solution containing fluoride anions.

29. The method of claim 28, wherein the solution contains tetrabutylammonium fluoride.

30. The method of claim 25, wherein the product comprises a cured ceramic precursor and after removing the mold, the method further comprises heating the cured

ceramic precursor to a temperature of at least 1000 °C to produce a ceramic.

31. The method of claim 25, further comprising transferring the product to a substrate selected from the group consisting of silicon, silicon dioxide, silicon nitride, and metal.

32. The method of claim 1, wherein the ceramic precursor is a single precursor.

33. The method of claim 1, wherein the ceramic precursor comprises a polymer.

34. The method of claim 1, wherein the ceramic precursor comprises an oligomer.

35. The method of claim 1, wherein the mold exhibits elastomeric properties.

36. The method of claim 35, wherein the mold comprises polydialkylsiloxane material.

37. The method of claim 1, wherein the step of filling the mold is performed under an inert atmosphere.

38. The method of claim 1, wherein the step of filling the mold is performed under a moisture-free atmosphere.

39. An article comprising a free standing ceramic structure with at least one component with a dimension less than 50 μm, the at least one component being integral with the article.

40. The article of claim 39, wherein the article is a molded article.

41. The article of claim 39, wherein the ceramic comprises a formula $Si_wB_xN_yC_z$.

42. The article of claim 39, wherein the ceramic has an oxide content of less than

about 30% by atomic composition.

43. The article of claim 39, wherein the ceramic is substantially free of structural degradation upon exposure to air at a temperature of greater than 1000 °C for at least 2 hours.

44. The article of claim 39, wherein the at least one component has an aspect ratio of at least about 2:1.

45. The article of claim 39, wherein the at least one component has an aspect ratio of at least about 4:1.

46. The article of claim 39, wherein the article is capable of withstanding temperatures greater than 2000 °C.

47. The article of claim 39, wherein the article can withstand temperatures less than 1500 °C in the presence of air for at least about 80 hours resulting in a change of less than a 10% in Young's Modulus of the article.

48. The article of claim 39, wherein the at least one component has a dimension less than 25 μm, the at least one component being integral with the article.

49. The article of claim 39, wherein the at least one component has a dimension less than 15 μm, the at least one component being integral with the article.

50. A method comprising:
providing a mold;
silanizing the mold; and
filling the mold with a ceramic precursor.

51. A method comprising:
providing a mold;

filling the mold with a ceramic precursor; and

dissolving the mold.